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(54) Continuous molded electrical connector

Kontinuierlich geformter elektrischer Verbinder

Connecteur électrique à moulage continu

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- **PATENT ABSTRACTS OF JAPAN vol. 17, no. 53 (M-1361), 3 February 1993 & JP 04 265718 A (SEIWA DENKI KK), 21 September 1992,**

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Description

[0001] This invention relates to the manufacture of continuous molded electrical connectors, and to the resultant strip of electrical header material.

BACKGROUND OF THE INVENTION

[0002] Electrical connectors comprising an insulating body having electrical contacts carried thereby are well known in the art. In the so-called male pin connectors, the insulating body carries pin-like contacts which extend above and below the insulating body to facilitate electrical connection from one element, such as a printed circuit board (PCB), to another element, which may, for example, comprise a so-called female connector. As is well known, a female connector comprises an insulating body which carries an electrical contact which is generally capable of receiving at one end thereof a male pin, and at the other end thereof an electrical conductor which may be another male pin, a single electrical conductor, or a single strand of a multiconductor flat ribbon cable. Typically, the aforedescribed male connector and female connector are utilized in a tandem or coupled fashion to provide electrical connection from one element such as the printed circuit paths on a PCB to individual conductors or the multiple conductors of a multiconductor ribbon cable.

[0003] The aforedescribed male and female type connectors are generally manufactured with a predetermined number of contacts carried thereby. For example, a typical male connector of the type described above might comprise a length of insulating material having two, ten, twenty, thirty, or any number of pins carried thereby. Similarly, a female connector may comprise a body of insulating material having individual cavities disposed therein, each cavity of which carries an electrical contact. Like the male connectors, the female connectors are commonly manufactured with two, ten, twenty, thirty, etc., contacts.

[0004] There are drawbacks associated with the manufacture and use of both male and female connectors of the type described above. The end user may use several connectors, each having a different number of electrical contacts or "positions". He must therefore purchase and inventory many different connector sizes, i. e. he must maintain a supply of 8-position, 12-position, 20-position connectors, etc.

[0005] A continuous connector strip for solving this problem was disclosed in U.S. Patent No. 4,230,387. U. S. Patent No. 4,832,622 (the '622 patent), whose contents are herein incorporated by reference, describes a better solution to the problem involving continuous extrusion or semi-continuous injection molding. Problems with the continuous extrusion scheme are that only simple header configurations are possible, and the extruded strip must in a subsequent step have holes punched and notches formed. While the semi-continuous injection molding scheme avoids the foregoing problems, it also has drawbacks, which will be best understood from the following description.

[0006] The latter method involves use of an angled protuberance (108) (see Fig. 11A of the '622 patent) on the end of a longitudinal spine (106) extending along the strip edge and which serves as the connection device for a number of units (102) which are each composed of a discretely molded segment. After the injection molding and cooling process, each discretely molded segment is removed from the mold cavity and indexed into a position such that the next discretely molded segment will in turn encapsulate, fuse or overmold the protuberance (108) of the previous segment. In this method, the protuberance (108) of the previous segment becomes encapsulated in or fused into the spine (106) and leading end unit (102) of the segment currently being molded. This achieves the interlocking of the two discretely molded segments to form a continuous length.

[0007] A first drawback with this method is that, the act of removing the discretely molded segment from the mold and indexing into a position such that the next cycle of the injection mold will encapsulate or fuse the protuberance in exactly the correct position is something that must be done with the highest precision, or the two strips will be out of pitch. Pitch is defined as the distance from one electrical connection device (pin, socket, etc.) to the adjacent one, and is of critical importance to the end assembler of the devices, who has to assemble, for example, a female connector with socket connectors of a given pitch to a male connector with pin connections of the same pitch. This method of interlocking the two discretely molded segments relies entirely on the repositioning of the first segment in precisely the correct location with relation to the mold cavity that will in turn mold the next segment. This is not easy to accomplish in the method described in the '622 patent.

[0008] A second drawback of the method presented above is the possibility of having weak joints due to poor materials, poor design, or improper processing conditions during the injection molding process. Weak joints would be subject to breakage, causing the two discretely molded segments to separate during the interconnecting device insertion process, shipment or during the end user's assembly process.

SUMMARY OF THE INVENTION

[0009] An object of the invention is an improved semi-continuous injection molding process for molding a continuous strip of insulating material with holes for receiving electrical or mechanical parts.

[0010] Another object of the invention is a continuous strip of injection molded insulating material provided with holes for receiving electrical or mechanical parts and preferably with severance means, such as notches, for severing from the strip discrete lengths of the material for use, for example, as electrical headers, said strip

having been made by separately molding discrete segments, wherein the discrete segments are interconnected by a stronger interlocking structure.

[0011] Accordingly, in a first aspect, the present invention provides a continuous strip of separable units for containing spaced electrical or mechanical components , said strip comprising: a consecutive series of at least three injection-molded segments of moldable material including end segments; each segment comprising a consecutive series of integrally-connected but severable units comprised of first leading and second trailing partially-formed end units and a plurality of completely-formed middle units between the end units, said middle and end units each being of the moldable material and separated along their length from each other; except for the end segments, one of the first and second end units of each segment having a portion integrally-molded with a projecting portion of the other of the first and second end units of the adjacent segment to form a completely-formed interlocking unit, whereby successive segments are integrally coupled by their respective interlocking unit and whereby the projecting portion of the other of the first and second end units of each segment has had a hole or recessed portion filled with molded material of the integrally-molded portion of the one of the first and second end units of the adjacent segment, said projecting portion of the other end unit being rearwardly projecting and extending approximately in line with the strip; the integrally coupled segments forming an elongated strip of molded separable completely-formed units; each of the middle units being similarly configured, the integrally-molded projecting portions of the first and second end units forming the interlocking units having a configuration substantially the same as that of the middle units, whereby each of the middle units and each of the interlocking units are usable when severed from the strip for receiving an electrical or mechanical component or as an electrical or mechanical component.

[0012] In a second aspect, the present invention provides a continuous strip of separable pin headers, said strip comprising: a consecutive series of injection-molded segments of a moldable material constituted of leading segments followed by trailing segments; each segment comprising a consecutive series of integrally connected but severable pin headers formed of the moldable material, and having leading and trailing portions and including at least one partially-formed trailing end unit, each segment comprising at least three header units; at least one leading end unit at the leading portion of each trailing segment having a portion overmolding the at least one partially-formed trailing end unit of the adjacent leading segment, whereby the successive segments are integrally coupled by the respective overmolded portions of the at least one trailing end unit and by the at least one leading end unit of the adjacent segment, and the at least one trailing end unit of each segment having a recessed portion or hole filled with the molded material of the overmolded portion of the at least one leading end unit of the adjacent segment; the integrally coupled segments forming a continuous strip of molded header units, said units each having at least one pin-receiving hole and being separated along their length from each other; and a plurality of spaced approximately in-line electrically-conductive pin components provided in said pin receiving holes in and along substantially the length of said continuous strip, whereby one or more individual header units containing pins can be severed from the strip as desired.

[0013] In a third aspect, the present invention provides a method of forming a continuous elongated injection-molded length of moldable material comprising a plurality of longitudinally spaced components having a desired pitch distance, comprising the steps: providing a mold shaped to form a first segment of moldable material, said first segment comprising a consecutive series of connected, integral units having a given thickness and comprised of leading end units and trailing end units and a plurality of middle units between the end units, at least the trailing end units forming a partially-formed projecting portion approximately in line with the middle units, said projecting portion being provided with recessed areas; introducing into the mold molten material and allowing same to cool to form a first segment of moldable material with the trailing end units comprising the projecting portion with the recessed areas; removing from the mold the first segment and reinserting the projecting portion of the first segment in the mold; introducing into the mold molten material and allowing same to cool to form a second segment with a leading end unit and trailing end unit and middle units with the leading end unit of the second segment overmolded with and at least partially encapsulating the projecting portion of the trailing end unit of the first segment and with the recessed areas in the projecting portion filled with molded material whereby the first and second segments are integrally coupled by their respective overmolded and projecting portions; repeating step (c) with respect to the second segment and step (d) to form a third segment integrally coupled with the second segment, and so on, whereby successive segments can be formed and integrally coupled to form an elongated continuous strip of molded segments; and providing the components along the length of the strip spaced so as to preserve the desired pitch distance.

[0014] In a fourth aspect, the present invention provides a method of forming a continuous elongated injection-molded length of moldable material comprising a plurality of spaced approximately in-line electrical or mechanical parts incorporated into and along a substantial part of the length of said moldable material, comprising the steps: providing a mold shaped to form a first segment of moldable material, said first segment comprising a consecutive series of connected, integral, moldable units comprised of first and second end units and a plurality of middle units between the end units, the

mold further being shaped such that an electrical or mechanical part can be provided at some of the middle and end units, at least the second end unit forming a projecting portion approximately in line with the electrical or mechanical parts; providing an electrical or mechanical part at the mold at positions corresponding to the position of some moldable units to be molded; introducing into the mold molten material and allowing same to cool to form a first segment of moldable material with some of the first and second end units and middle units incorporating and molded around an electrical or mechanical part; removing from the mold the first segment with its incorporated parts and reinserting the second end unit of the first segment in the mold; providing an electrical or mechanical part at the mold at positions corresponding to the position of some moldable units to be molded; introducing into the mold molten material and allowing same to cool to form a second segment with first and second end units and middle units with some of the first and second end units and middle units incorporating and molded around an electrical or mechanical part and with the first end unit of the second segment overlapping with the second end unit of the first segment, whereby the first and second segments are integrally coupled by their respective second and first end units with their respective incorporated electrical or mechanical parts aligned; and repeating steps (d), (e) and (f) with respect to successive segments, and so on, whereby successive segments can be formed and integrally coupled to form said elongated length of moldable material incorporating electrical or mechanical parts.

[0015] Thus, each segment has a trailing projecting portion, substantially in-line with the strip, with undercuts or recessed regions behind the projecting portion. The projecting portion of each previously-molded segment is reinserted in the mold and the leading portion of the next segment molded over and around the projecting portion to provide a strong interlocking structure substantially in-line with the connector strip.

[0016] In a preferred embodiment, the projecting portion has a hole for receiving an electrical or mechanical part, and the overmolded part also has a hole, with both holes aligned to receive the electrical or mechanical part. In this way, despite the fact that the resultant interlocking structure is in-line in the strip, a space for an electrical or mechanical part is not lost, so that for an application where, say, electrical pins are provided in evenly-spaced holes in the strip, a pin can also be placed in the aligned holes of the interlocking structure to maintain the symmetry.

[0017] These and other objects and attainments together with a fuller understanding of the invention will become apparent and appreciated by referring to the following descriptions and claims taken in conjunction with the accompanying drawings which illustrate by way of example and not limitation preferred embodiments of the invention and wherein like reference numerals denote like or corresponding parts.

SUMMARY OF THE DRAWINGS

[0018] In the drawings:

Figs. 1 and 2 are perspective view of continuous strips of one row and two rows, respectively, of pin connectors in accordance with the invention;
Fig. 3 is a perspective view of one molded segment of a continuous connector strip as shown in Fig. 1;
Fig. 4 is a perspective view showing how the end regions of adjacent segments form an interlocking structure according to the invention;
Figs. 4A and 4B are cross-sections of the structure of Fig. 4 taken along the lines 4A-4A and 4B-4B, respectively, of Fig. 6;
Figs. 5 and 6 are plan and elevational views, respectively, of the segment of Fig. 4;
Fig. 7 illustrates manufacture of a continuous strip according to the invention;
Fig. 8 illustrate how the user would receive a reeled continuous strip.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0019] The '622 patent illustrates various pin header configurations available from a continuous strip of insulating material with holes filled with contact elements. Figs. 1 and 2 illustrate comparable parts available from a continuous strip according to the invention.

[0020] The continuous strip 10 comprises, integrally connected, individual units 12 separated by severance means, in this instance spaced pairs of notches 14 between each unit 12 forming weakened regions where the strip can easily be severed to form one or multiple pin headers. The notches also assist in flexing of the strip for later coiling on a reel, provides a convenient reference point for indexing of the strip, and determines a specific web size between units 12 to control unit spacing. Each of the units 12 in this case have vertical through-holes 16, beveled 18 at the top or bottom, for receiving straight pin terminals 20.

[0021] The pins 20 have a substantially square cross section, or alternatively of a different cross-section, such as round or rectangular, and also may have an expanded "star" section in the area covered by the plastic header for improved strength and for form-fitting with the insulating plastic to prevent longitudinal displacement of the inserted pins. The sides of the strip 10 have the notches 14 formed therein, which notches are substantially U-shaped. The U-shaped notches 14 are directed substantially perpendicular to the longitudinal axis of the strip 10. By severing the strip at the two opposing notches, an electrical connector having a predetermined number of pin terminals can be formed. In the description which follows, the method of the invention will be described in connection with the manufacture of a single-row connector. However, other connectors, such as

those shown in Fig. 2 and in Figs. 2-4 of the '622 patent, can be manufactured in accordance with the invention.

[0022] Fig. 2 is a view of a double-row strip 10' according to the invention, with each unit 12 containing two holes 16 each containing a pin 20, with each unit 12' separated by pairs of notches 14. In this case, the strip 10' is wider than the strip shown in Fig. 1 so that pairs of holes 16 can be formed for receiving the two rows of straight pins 20.

[0023] The method according to the invention is not limited to the formation of continuous connector strip having straight pin terminals. Fig. 3B of the '622 patent shows an end view of an endless connector having right-angle pin terminals inserted in holes formed in the strip, and Fig. 4B of the '622 patent shows a strip having two rows of right-angle pin terminals. Although the connector strip shown are provided with pin terminals, it is apparent that an electrical connector can be manufactured according to the invention having any type of electrical components inserted in the continuous strip.

[0024] Fig. 3 illustrates what is herein termed one segment 22 of the continuous strip, which is made up of a plurality of such segments 22 interlocked or fused together. Each segment 22 is constituted of a plurality of units 12, and includes end units comprised of a leading end unit 24 and a trailing end unit 26 (explained below), each with the approximately same sized hole 16 as the middle units 12 between the end units 24, 26.

[0025] A feature of the invention is the use of the end units 24, 26 of adjacent segments 22 to form a strong interlocking structure connecting the discretely molded segments 22 into a continuous strip 10. This is accomplished with an improved style of interlocking feature, which in addition also uses core pins in the mold cavity to assure positive alignment of the previously molded segment. A typical injection mold for plastic material is shown in Fig. 7 at 30, divided into 2 halves. The mold top 31, which seals off the mold cavities 32 at top, is shown separately for simplicity. The cavities 32 have the configuration to mold a single segment 22, with the cavity 34 at the left end for receiving the previously molded segment unit 33 next to the previously molded trailing end unit 26, the cavity 35 next to the end cavity 34 for receiving the trailing end unit 26 of the previously molded segment and for overmolding over the end unit 26 the leading end unit 24 of the next segment, and the cavity 36 at the right end for molding the trailing end unit 24 of the next segment. Only the parts 33 and 26 of the previous segment are shown, the new segment yet to be molded is not shown. After each molding cycle, still to be described, when the mold halves are separated, ejector means (not shown) will free the just-molded segment, so it can be advanced as shown by the arrow 60. Subgates 38 provide passageways for the molten plastic. During the molding process, inert core pins 42, 43 mounted on the top mold part 31 are positioned in each cavity where a hole 16 is to be formed. The lateral spacing of the core pins 42, 43 is determined by their mounting in the top core half 31.

[0026] The end unit 26 has a hole 16 molded into it that is in pitch with all the other holes 16 in the insulating segment 22 which will in a later process have interconnect devices (pins/socket/etc.) inserted into them. After the first (called previous) discrete segment is molded and cooled, the mold halves are separated and the just-molded segment is ejected and indexed for the next cycle of the mold. After the mold halves are separated, the discretely molded previous segment is ejected from the mold cavity and indexed by a mechanism such as the motor driven gears 44 shown to the proper position for the next molding cycle. In this position, the unit 33 next to the interlock end unit 26 as well as the latter are both retained or reinserted in the end cavities 34, 35 of the mold. When the mold halves are closed in preparation for the next molding cycle, the core pins 42 of the two end-most positions 34, 35 go into the holes of the unit 33 next to the interlocked units and the end unit 26 into the cavity bottom if a through-hole is to be made. This serves to assist in the final location of the previously molded segment with relation to the cavity which will mold the next segment. Any minute error in the initial location of the previously molded segment is corrected by the positive positioning provided by the two core pins 42 going into the two holes in the two units 33, 26 which remain in the mold and whose lateral spacing is fixed by the mold.

[0027] The next cycle of the mold fills the cavities with molten plastic, and encapsulates the trailing end unit 26 inside the overmolded part 24 of the next segment. The design of the interlock feature is such that the interlock joint is not the weak joint of the system. This is obtained by making the strength of the trailing end and leading units approximately the same, so that the combined strength of the overmolded interlocked joint is approximately the same as that of the middle units, which makes the notched regions the weakest links in the strip. In a preferred embodiment, substantially equal strength is obtained by a configuration of the trailing end 26, at the cross-sectional area indicated by 70 in Fig. 4B, that is substantially the same as the cross-sectional area at the smallest section of the web, indicated at 71 in Fig. 4A. In other words, even in the molded state (prior to interconnect device insertion into the insulator), the interlock joint is stronger in tension, bending and twisting than the webs between the notches 14 that separate each unit of the discretely molded segment. This is an important feature so that the process that follows the injection molding, typically interconnect device insertion, can utilize the full range of flexibility and strength of the discretely molded segments, and not be limited by the joint at the interlocking units.

[0028] A further feature of the invention is that, even though the design is such that the interlock area is not the weakest link in the strip, a factor of safety is achieved by device insertion. Once a pin or other electrical or mechanical part is inserted into the aligned holes 16 that is

the trailing end unit 26 and the over molded material from the subsequent mold cycle forming the leading end unit 24, the two discrete segments are truly locked together. This is an important feature because, even though the interlocking mechanism is designed to be stronger in tension, bending and twisting than the webs of the discretely molded segments, improper processing conditions or the need for certain materials which may not fuse together during molding, may lead to the condition where eventually the end unit 26 from the previous segment can be removed from the encapsulating material 24 of the next segment. Once, however, a pin for example, is inserted into the aligned holes 16, the two segments are positively locked together and a higher strength preventing separation is achieved.

[0029] Another benefit of the invention is that, when the molten plastic is injected into the cavity, it is done so at an extremely high pressure. In the design described in the '622 patent, the protuberance from the previous segment which extends into the cavity segment will experience high stresses from this high pressure molten plastic. This stress can damage or weaken the protuberance resulting in a weak joint which is undesirable. In the present invention, the inner end unit 26 is not free to move or flex in the cavity, as it is held tightly in position by the core pin 42 that goes through the hole in it, thereby securing it in place. Because the end unit can not move when subjected to the flow of molten plastic at such high pressures, it will not be damaged or weakened in the injection molding process, and will retain its mechanical properties, providing a strong interlocking joint.

[0030] The indexing mechanism 44 is easily controlled to advance each previous segment to the proper position for the core pins 42 to align same for the next molded segment. The positive alignment provided by the core pins insure proper unit to unit pitch.

[0031] Fig. 4 shows at the left the previous segment 22 with trailing end unit 26 nesting within the overmolded leading end unit 24 of the next segment 22', with their respective holes 16 aligned to received a common electrical or mechanical element.

[0032] As shown in Fig. 7, as the continuous strip 48 formed of successive interlocked molded segments 22 is molded in this step-by-step, indexing process, it can be passed through a known inserter machine 50 for inserting pins or other elements into some or all of the holes 16 of the strip, and then the resultant strip 10 wound up in a continuous fashion on a reel 52 for distribution to a user. From the reel 52, the user at a PCB manufacturing station can unreel the strip 10 either manually or automatically by machine --shown in Fig. 8 with tab electrical connectors 54-- and as described sever sections with the desired number of tabs for mounting onto a PCB by an inserter machine.

[0033] While the more common application of the invention will involve electrical contacts, such as pins, sockets, tabs, terminals and the like, for receiving electrical connectors, there are also mechanical applications of the invention. One such example can be found in U.S. Patent 5,148,596, (also incorporated herein by reference) which, in the embodiment disclosed in Figs. 18-22, describes the insertion of posts on a PCB to serve as mechanical guides for electrical connectors. Such posts can also be inserted in holes in the continuous molded strip of the invention, and positions containing one or more posts severed from the continuous strip for mounting on the PCB. In this instance, the posts need not extend completely through the holes in the strip, as would normally be preferred for electrical contacts where the portions protruding from the bottom can be used for mounting of the header on the PCB, as well as for making additional circuits connections on the opposite side of the PCB. It will also be appreciated from this application that the holes in the strip need not be through-holes, but can also be blind holes for receiving mechanical or electrical parts.

[0034] Similarly, while the more common and preferred arrangement employs evenly spaced through-holes with each hole in both the end and middle units filled with an electrical contact, there can be users for uneven patterns of contacts. Thus, holes are not essential in all the units, nor are contacts essential in all the holes. Holes, through or blind, need only be located where needed or to receive a core pin.

[0035] Similarly, with a strip of equally spaced holes and contacts, it is preferred to mold sets of notches separating each contact, allowing any desired header length to be severed at any of the notched separators. However, if the user has a need for, for example, 3-pin headers, then notches need only be provided between every third and fourth pin where severing will occur. Alternatively, it the user needs both 2-pin and 3-pin headers, then the notches need only be provided at 3 and 4 pin positions, thus where the user intends to sever discrete header components.

[0036] It will also be appreciated that other structures capable of weakening the strip along discrete lengths thereof, for easy separation of the strip at the weakened regions, can be substituted for the notches.

[0037] The number of units provided in each segment is not critical. It can vary from 3 to more than 50, depending on mold and part size. A typical value would be about 32 units with a pitch of about 0.1 inches, a height of about 0.1 inches, for 0.025 inch square standard pins, and with a web width, between the notches, of about 1/3 the unit width.

[0038] As will be observed in Figs. 3 and 5, the trailing end unit 26 forms a kind of knob-shaped in-line protuberance with a recessed or reduced width section 60 behind the front axial surface. As a result, material of the overmolded leading end unit 24 extends into this reduced width section which enhances the interlocking of the two segments. As an alternative, if the position is not needed by the customer, the core pin 42 which engages the hole 16 in the end unit 26 may be omitted. As a result,

injected plastic will fill that hole 16 and provide additional strength to the assembly of segments. The remaining core pin 42 will still function for alignment of adjacent segments. Other core pins 43 may also be eliminated if desired.

[0039] The use of semi-continuous injection molding offers several advantages over extrusion. Holes with lead-ins --the bevels 18-- may be molded directly. Higher-temperature plastics can be used. Greater dimensional accuracy is possible. Pitch is more consistent. The parts are cleaner since no plastic need be removed as is required for extrusion. Also secondary machining or punching operations necessary with extrusions are eliminated.

[0040] The shape and size of the knob-shaped end 16 is preferably chosen such that its strength is approximately the same as the strength of the overmolded plastic that encapsulates the knob-shaped end, so together they provide a strength of plastic substantially equal to that of one of the middle units 12, which contributes to the strength of the interlocking structure thus formed. Substantially equal strength can be obtained by making the volume of the trailing end 16 approximately the same as the volume of the overmolded plastic. To further ensure that the notched region represents the weakest link to ensure severing at the proper locations, in a further prepared embodiment, preferably the cross-section of the section 70 shown by hatching in Fig. 4B is equal to or larger than the smallest cross-section 71 through the center of the web between a pair of notches 14.

[0041] The core pins need not be round, as shown. They can also be rectangular, square or otherwise shaped as required for the part to be subsequently inserted.

[0042] In accordance with the invention, it is also possible that the electrical or mechanical part is simultaneously molded into and together with each segment. For example, the core pins 42 in Fig. 7 can be separable pins that left in the molded segment following its molding.

[0043] While the invention has been described in conjunction with specific embodiments, it will be evident to those skilled in the art that many alternatives, modifications and variations will be apparent in light of the foregoing description. Accordingly, the invention is intended to embrace all such alternatives, modifications and variations as fall within the scope of the appended claims.

Claims

1. A continuous strip (10) of separable units (12) for containing spaced electrical or mechanical components (20), said strip comprising:

   (a) a consecutive series of at least three injection-molded segments (22) of moldable material including end segments;

   (b) each segment (22) comprising a consecutive series of integrally-connected but severable units (12) comprised of first leading (24) and second trailing (26) partially-formed end units and a plurality of completely-formed middle units between the end units, said middle and end units each being of the moldable material and separated along their length from each other;

   (c) except for the end segments, one of the first and second end units (26) of each segment (22) having a portion integrally-molded with a projecting portion of the other of the first and second end units (24) of the adjacent segment to form a completely-formed interlocking unit, whereby successive segments (22) are integrally coupled by their respective interlocking unit and whereby the projecting portion of the other (24) of the first and second end units of each segment has had a hole or recessed portion filled with molded material of the integrally-molded portion of the one (26) of the first and second end units of the adjacent segment, said projecting portion of the other end unit (24) being rearwardly projecting and extending approximately in line with the strip (10);

   (d) the integrally coupled segments (22) forming an elongated strip (10) of molded separable completely-formed units (12);

   (e) each of the middle units being similarly configured, the integrally-molded projecting portions of the first and second end units forming the interlocking units having a configuration substantially the same as that of the middle units,

   whereby each of the middle units and each of the interlocking units are usable when severed from the strip for receiving an electrical or mechanical component or as an electrical or mechanical component.

2. The strip of Claim 1, wherein the middle units each have a hole (16) of given size for receiving an electrical or mechanical component (20), and the interlocking units each also have a hole (16) of the given size for receiving an electrical or mechanical component.

3. The strip of Claim 2, wherein the holes in the middle units and interlocking units (12) have a given pitch, further comprising a plurality of spaced approximately in-line electrical or mechanical components (20) each mounted in one of the holes (16) in the middle and interlocking units along substantially the length of said elongated strip (10), whereby a desired pitch distance between the mounted compo-

nents is preserved within the consecutive series of segments (22) and one or more individual units (12) can be severed from the strip as desired.

4. The strip of Claim 1, further comprising notches (14) between the units (12) positioned so as to allow each unit when severed at a notch to form a complete unit without any excess removable scrap.

5. A continuous strip as claimed in Claim 1, wherein the middle units each have a hole (16) of given size for receiving an electrical or mechanical component (20), the projecting portion (26) also has at least one component-receiving hole (16) for receiving an electrical or mechanical component, the integrally-molded portion (24) allowing access by the electrical or mechanical component to the at least one component-receiving hole in the projecting portion.

6. A continuous strip as claimed in Claim 5, wherein the component-receiving holes (16) are evenly spaced and a desired pitch distance between the mounted components (20) is preserved.

7. A continuous strip as claimed in Claim 1, further comprising a plurality of spaced approximately in-line electrical or mechanical components (20) in the form of electrical pins each mounted in one of the holes (16) in the middle and interlocking units along substantially the length of said elongated strip (10), whereby a desired pitch distance between the mounted pins is preserved within the consecutive series of segments (22) and one or more individual units (12) as separable pin headers can be severed from the strip as desired.

8. A continuous strip as claimed in Claim 7, wherein the separable pin headers (12) are separated by severance means (14).

9. In combination with the strip of Claim 1, a reel (52), the strip (10) being wound up on the reel.

10. A continuous strip (10) of separable pin headers (12), said strip comprising:

a) a consecutive series of injection-molded segments (22) of a moldable material constituted of leading segments (22') followed by trailing segments (22);
b) each segment (22,22') comprising a consecutive series of integrally connected but severable pin headers (12) formed of the moldable material, and having leading and trailing portions and including at least one partially-formed trailing end unit (24), each segment comprising at least three header units;
c) at least one leading end unit (26) at the leading portion of each trailing segment (22) having a portion overmolding the at least one partially-formed trailing end unit (24) of the adjacent leading segment (22'), whereby the successive segments (22,22') are integrally coupled by the respective overmolded portions of the at least one trailing end unit (24) and by the at least one leading end unit (26) of the adjacent segment (22), and the at least one trailing end unit (24) of each segment having a recessed portion or hole filled with the molded material of the overmolded portion of the at least one leading end unit (26) of the adjacent segment (22);
d) the integrally coupled segments (22,22') forming a continuous strip (10) of molded header units (12), said units each having at least one pin-receiving hole (16) and being separated along their length from each other; and
e) a plurality of spaced approximately in-line electrically-conductive pin components (20) provided in said pin receiving holes (16) in and along substantially the length of said continuous strip (10), whereby one or more individual header units (12) containing pins (20) can be severed from the strip as desired.

11. A continuous strip (10) as claimed in Claim 10, wherein the overmolded portion also has at least one pin-receiving hole (16) for receiving an electrically-conductive component (20) and the overmolding portion allowing access by the electrically-conductive component (20) to the at least one pin-receiving hole in the projecting portion.

12. A continuous strip as claimed in Claim 10, wherein each leading end unit (26) and partially-formed trailing end unit (24) that are overmolded have a hole (16) for receiving a pin component (20) and the holes are aligned.

13. A method of forming a continuous elongated injection-molded length of moldable material comprising a plurality of longitudinally spaced components (20,54) having a desired pitch distance, comprising the steps:

(a) providing a mold (30) shaped to form a first segment (22) of moldable material, said first segment (22) comprising a consecutive series of connected, integral units (12) having a given thickness and comprised of leading end units (24) and trailing end units (26) and a plurality of middle units between the end units, at least the trailing end units (26) forming a partially-formed projecting portion approximately in line with the middle units, said projecting portion being provided with recessed areas;
(b) introducing into the mold (30) molten mate-

rial and allowing same to cool to form a first segment (22) of moldable material with the trailing end units (26) comprising the projecting portion with the recessed areas;

(c) removing from the mold (30) the first segment and reinserting the projecting portion of the first segment in the mold;

(d) introducing into the mold (30) molten material and allowing same to cool to form a second segment with a leading end unit and trailing end unit and middle units with the leading end unit (24) of the second segment overmolded with and at least partially encapsulating the projecting portion of the trailing end unit (26) of the first segment and with the recessed areas in the projecting portion filled with molded material whereby the first and second segments are integrally coupled by their respective overmolded and projecting portions;

(e) repeating step (c) with respect to the second segment and step (d) to form a third segment integrally coupled with the second segment, and so on, whereby successive segments can be formed and integrally coupled to form an elongated continuous strip (10) of molded segments (22); and

(f) providing the components along the length of the strip spaced so as to preserve the desired pitch distance.

14. The method of Claim 13, wherein the units (12) are header units and the components are electrical pins (20).

15. The method of Claim 14, further comprising the step of winding the continuous strip (10) onto a reel (52).

16. The method of Claim 14, further comprising the step of, during steps (b), (d), and (e), using core pins (43) spaced by the desired pitch distance for forming holes (16) in the units (12) to receive the electrical pins (20) including at least one pin-receiving hole (16) in the projecting portion.

17. The method of Claim 14, further comprising the step of, during steps (b), (d), and (e), forming aligned pin-receiving holes in the overmolded trailing end (16) and leading end (24) units to receive the electrical pins (20).

18. A method of forming a continuous elongated injection-molded length (10) of moldable material comprising a plurality of spaced approximately in-line electrical or mechanical parts (20,54) incorporated into and along a substantial part of the length of said moldable material, comprising the steps:

(a) providing a mold (30) shaped to form a first segment (22) of moldable material, said first segment comprising a consecutive series of connected, integral, moldable units (12) comprised of first and second end units (24,26) and a plurality of middle units between the end units, the mold further being shaped (43) such that an electrical or mechanical part (20,54) can be provided at some of the middle and end units, at least the second end unit (26) forming a projecting portion approximately in line with the electrical or mechanical parts;

(b) providing an electrical or mechanical part (20,54) at the mold at positions corresponding to the position of some moldable units to be molded;

(c) introducing into the mold (30) molten material and allowing same to cool to form a first segment (22) of moldable material with some of the first and second end units and middle units incorporating and molded around an electrical or mechanical part (20,54);

(d) removing from the mold the first segment with its incorporated parts (20,54) and reinserting the second end unit (26) of the first segment in the mold (30);

(e) providing an electrical or mechanical part at the mold at positions corresponding to the position of some moldable units to be molded;

(f) introducing into the mold (30) molten material and allowing same to cool to form a second segment (22) with first and second end units (24,26) and middle units with some of the first and second end units and middle units incorporating and molded around an electrical or mechanical part and with the first end unit (24) of the second segment overlapping with the second end unit (26) of the first segment, whereby the first and second segments are integrally coupled by their respective second and first end units with their respective incorporated electrical or mechanical parts (20,54) aligned; and

(g) repeating steps (d), (e) and (f) with respect to successive segments, and so on, whereby successive segments can be formed and integrally coupled to form said elongated length (10) of moldable material incorporating electrical or mechanical parts.

19. The method of Claim 18, further comprising the step of:

(h) providing an electrical or mechanical part (20,54) at the mold at positions corresponding to the position of the second end unit (26) of each of the segments (22).

20. The method of Claim 18, further comprising the step of winding the continuous length (10) onto a reel (52).

Patentansprüche

1. Ein kontinuierlicher Streifen (10) von trennbaren Einheiten (12) zur Aufnahme von beabstandeten elektrischen oder mechanischen Komponenten (20), wobei der Streifen umfasst:

   a) eine aufeinanderfolgende Reihe von wenigstens drei per Spritzguss geformten Segmenten (22) aus einem formbaren Material mit Endsegmenten;

   b) jedes Segment (22) umfassend eine aufeinanderfolgende Reihe von integral-verbundenen aber abtrennbaren Einheiten (12) umfassend eine erste führende (24) und zweite hintere (26) teilweise-gebildeten Endeinheiten und eine Vielzahl von vollständig-gebildeten mittleren Einheiten zwischen den Endeinheiten, wobei die mittleren und die Endeinheiten jeweils aus dem formbaren Material sind und entlang ihrer Länge voneinander getrennt sind;

   c) wobei außer für die Endsegmente eine der ersten und zweiten Endeinheiten (26) jedes Segments (22) einen Abschnitt aufweist, der mit einem vorstehenden Abschnitt der anderen der ersten und zweiten Endeinheiten (24) des benachbarten Segments integral-geformt ist, um eine vollständig-gebildete Verriegelungseinheit zu bilden, wobei sukzessive Segmente (22) durch ihre jeweilige Verriegelungseinheit integral gekoppelt sind und wobei der vorstehende Abschnitt der anderen (24) der ersten und zweiten Endeinheiten jedes Segments ein Loch oder einen ausgesparten Abschnitt mit geformten Material des integral-geformten Abschnitts der einen (26) der ersten und zweiten Endeinheiten des benachbarten Segments gefüllt gehabt hatte, wobei der vorstehende Abschnitt der anderen Endeinheit (24) nach hinten vorsteht und ungefähr in einer Linie mit dem Streifen (10) verläuft;

   d) wobei die integral gekoppelten Segmente (22) einen länglichen Streifen (10) von geformten trennbaren vollständig-gebildeten Einheiten (12) bilden;

   e) wobei jede der mittleren Einheiten in ähnlicher Weise konfiguriert ist, wobei die integral-geformten vorstehenden Abschnitte der ersten und zweiten Endeinheiten die Verriegelungseinheiten bilden, die eine Konfiguration aufweisen, die im wesentlichen die gleiche wie diejenige der mittleren Einheiten ist;

   wobei jede der mittleren Einheiten und jede der Verriegelungseinheiten, wenn sie von dem Streifen abgetrennt sind, zur Aufnahme einer elektrischen oder mechanischen Komponente oder als eine elektrische oder mechanische Komponente verwendbar sind.

2. Der Streifen nach Anspruch 1, wobei die mittleren Einheiten jeweils ein Loch (16) mit einer gegebenen Größe zur Aufnahme einer elektrischen oder mechanischen Komponente (2) aufweisen und die Verriegelungseinheiten ebenfalls ein Loch (16) der gegebenen Größe zur Aufnahme einer elektrischen oder mechanischen Komponente aufweisen.

3. Streifen nach Anspruch 2, wobei die Löcher in den mittleren Einheiten und den Verriegelungseinheiten (12) einen gegebenen Abstand aufweisen, ferner umfassend eine Vielzahl von beabstandet ungefähr in einer Linie angeordneten elektrischen oder mechanischen Komponenten (20), die jeweils in einem der Löcher (16) in den mittleren und den verriegelnden Einheiten entlang im wesentlichen der Länge des länglichen Streifens (10) angebracht sind, wobei eine gewünschte Abstandsentfernung zwischen den angebrachten Komponenten innerhalb der aufeinanderfolgenden Reihe von Segmenten (22) sichergestellt wird und eine oder mehrere einzelne Einheiten (12) von dem Streifen wunschgemäß abgetrennt werden können.

4. Der Streifen nach Anspruch 1, ferner umfassend Kerben (14) zwischen den Einheiten (12), die so positioniert sind, dass jeder Einheit, wenn sie an einer Kerbe abgetrennt wird, ermöglicht wird, eine vollständige Einheit ohne irgendwelchen überschüssigen entfernbaren Abfall zu bilden.

5. Ein kontinuierlicher Streifen nach Anspruch 1, wobei die mittleren Einheiten jeweils ein Loch (16) einer gegebenen Größe zur Aufnahme einer elektrischen oder mechanischen Komponente (12) aufweisen, der vorstehende Abschnitt (26) auch wenigstens ein Komponentenaufnahmeloch (16) zur Aufnahme einer elektrischen oder mechanischen Komponente aufweist, wobei der integral-geformte Abschnitt (24) einen Zugang durch die elektrische oder mechanische Komponente auf das wenigstens eine Komponentenaufnahmeloch in dem vorstehenden Abschnitt ermöglicht.

6. Ein kontinuierlicher Streifen nach Anspruch 5, wobei die Komponentenaufnahmelöcher (16) gleichmäßig beabstandet sind und eine gewünschte Abstandsentfernung zwischen den angebrachten Komponenten (20) sichergestellt wird.

7. Ein kontinuierlicher Streifen nach Anspruch 1, ferner umfassend eine Vielzahl von beabstandeten

ungefähr in einer Linie angeordneten elektrischen oder mechanischen Komponenten (20) in der Form von elektrischen Stiften, die jeweils in einem der Löcher (16) in den mittleren und verriegelnden Einheiten entlang im wesentlichen der Länge des länglichen Streifens (10) angebracht sind, wobei eine gewünschte Abstandsentfernung zwischen den angebrachten Stiften innerhalb der aufeinanderfolgenden Reihe von Segmenten (22) aufrechterhalten wird und eine oder mehrere individuelle Einheiten (12) als trennbare Stiftköpfe von dem Streifen wunschgemäß abgetrennt werden können.

8. Ein kontinuierlicher Streifen nach Anspruch 7, wobei die trennbaren Stiftköpfe (12) durch eine Abtrenneinrichtung (14) getrennt werden.

9. In Kombination mit dem Streifen nach Anspruch 1, eine Rolle (52), wobei der Streifen (10) auf die Rolle aufgewickelt ist.

10. Ein kontinuierlicher Streifen (10) von trennbaren Stiftköpfen (12), wobei der Streifen umfasst:

a) eine aufeinanderfolgende Reihe von per Spritzguss geformte Segmente (22) aus einem formbaren Material, die aus führenden Segmenten (22') gefolgt von hinteren Segmenten (22) gebildet ist;

b) jedes Segment (22, 22') umfassend eine aufeinanderfolgende Reihe von integral verbundenen aber abtrennbaren Stiftköpfen (12), die aus dem formbaren Material gebildet sind, und mit führenden und hinteren Abschnitten und mit wenigstens einer teilweise-gebildeten hinteren Endeinheit (24), wobei jedes Segment wenigstens drei Kopfeinheiten umfasst;

c) wobei wenigstens eine führende Endeinheit (26) an dem führenden Abschnitt jedes hinteren Segments (22) einen Abschnitt aufweist, der die wenigstens eine teilweise-gebildete hintere Endeinheit (24) des benachbarten führenden Segments (22') überformt, wobei die aufeinanderfolgenden Segmente (22, 22') integral durch die jeweiligen übergeformten Abschnitte der wenigstens einen hinteren Endeinheit (24) und durch die wenigstens eine führende Endeinheit (26) des benachbarten Segments (22) integral gekoppelt sind, und wobei die wenigstens eine hintere Endeinheit (24) jedes Segments einen ausgesparten Abschnitt oder ein Loch aufweist, welches mit dem geformten Material des übergeformten Abschnitts der wenigstens einen führenden Endeinheit (26) des benachbarten Segments (22) gefüllt ist;

d) wobei die integral gekoppelten Segmente (22, 22') einen kontinuierlichen Streifen (10) von geformten Kopfeinheiten (12) bildet, wobei die Einheiten jeweils wenigstens ein Stiftaufnahmeloch (16) aufweist und entlang ihrer Länge voneinander getrennt sind; und

e) eine Vielzahl von beabstandeten ungefähr in einer Linie angeordneten elektrisch-leitenden Stiftkomponenten (20), die in den Stiftaufnahmelöchern (16) in und entlang im wesentlichen der Länge des kontinuierlichen Streifens (10) vorgesehen sind, wobei ein oder mehrere einzelne Kopfeinheiten (12) die Stifte (20) enthalten, von dem Streifen wunschgemäß abgetrennt werden können.

11. Ein kontinuierlicher Streifen (10) nach Anspruch 10, wobei der übergeformte Abschnitt auch wenigstens ein Stiftaufnahmeloch (16) zur Aufnahme einer elektrisch-leitenden Komponente (20) aufweist und der übergeformte Abschnitt einen Zugang durch die elektrisch-leitende Komponente (20) auf das wenigstens eine Stiftaufnahmeloch in dem vorstehenden Abschnitt erlaubt.

12. Ein kontinuierlicher Streifen nach Anspruch 10, wobei jede führende Endeinheit (26) und teilweise-gebildete hintere Endeinheit (24), die überformt sind, ein Loch (16) zur Aufnahme einer Stiftkomponente (20) aufweisen und die Löcher ausgerichtet sind.

13. Verfahren zum Bilden einer kontinuierlichen länglichen per Spritzguss geformten Länge aus einem formbaren Material, umfassend eine Vielzahl von longitudinal beabstandeten Komponenten (20, 54), die eine gewünschte Abstandsentfernung aufweisen, umfassend die folgenden Schritte:

a) Bereitstellen einer Form (30), die ausgebildet ist, um ein erstes Segment (22) eines formbaren Materials zu bilden, wobei das erste Segment (22) eine aufeinanderfolgende Reihe von verbundenen integralen Einheiten (12) mit einer gegebenen Dicke und umfassend führende Endeinheiten (24) und hintere Endeinheiten (26) und eine Vielzahl von mittleren Einheiten zwischen den Endeinheiten umfasst, wobei wenigstens die führenden Endeinheiten (26) einen teilweise-gebildeten vorstehenden Abschnitt aufweisen, der ungefähr in einer Linie zu den mittleren Einheiten ist, wobei der vorstehende Abschnitt mit ausgesparten Gebieten versehen ist;

b) Einleiten von geschmolzenem Material in die Form (30) und Ermöglichen einer Abkühlung der gleichen, um ein erstes Segment (22) aus

einem formbaren Material zu bilden, wobei die hinteren Endeinheiten (26) den vorstehenden Abschnitt mit den ausgesparten Gebieten umfasst;

c) Entfernen des ersten Segments.von der Form (30) und erneutes Einsetzen des vorstehenden Abschnitts des ersten Segments in die Form;

d) Einleiten von geschmolzenem Material in die Form (30) und Zulassen einer Abkühlung der gleichen zum Bilden eines zweiten Segments mit einer führenden Endeinheit und einer hinteren Endeinheit und mittleren Einheiten mit der führenden Endeinheit (24) des zweiten Segments übergeformt mit und wenigstens teilweise den vorstehenden Abschnitt der hinteren Endeinheit (26) des ersten Segments verkapselnd und mit den ausgesparten Gebieten in dem vorstehenden Abschnitt mit geschmolzenem Material gefüllt, wobei die ersten und zweiten Segmente durch ihre jeweiligen übergeformten und vorstehenden Abschnitte integral gekoppelt werden;

e) Wiederholen des Schritts c) bezüglich des zweiten Segments und des Schritts d) zum Bilden eines dritten Segments, welches integral mit dem zweiten Segment gekoppelt ist, usw., wobei sukzessive Segmente gebildet und integral gekoppelt werden können, um einen länglichen kontinuierlichen Streifen (10) aus geformten Segmenten (22) zu bilden; und

f) Bereitstellen der Komponenten entlang der Länge des Streifens beabstandet, um so die gewünschte Abstandsentfernung aufrecht zu erhalten.

14. Verfahren nach Anspruch 13, wobei die Einheiten (12) Kopfeinheiten sind und die Komponenten elektrische Stifte (20) sind.

15. Verfahren nach Anspruch 14, ferner umfassend den Schritt einer Aufwicklung des kontinuierlichen Streifens (10) auf einer Rolle (52).

16. Verfahren nach Anspruch 14, ferner umfassend den Schritt, während der Schritte b), d) und e), eines Verwendens von Kernstiften (43), die um die gewünschte Abstandsentfernung beabstandet sind, zum Bilden von Löchern (16) in den Einheiten (12) zur Aufnahme der elektrischen Stifte (20) mit wenigstens einem StiftAufnahmeloch (16) in dem vorstehenden Abschnitt.

17. Verfahren nach Anspruch 14, ferner umfassend den Schritt, während der Schritte b), d) und e), eines Bildens von ausgerichteten Stiftaufnahmelöchern in den übergeformten hinteren End-(16) und führenden End-(24) Einheiten zur Aufnahme der elektrischen Stifte (20).

18. Verfahren zum Bilden einer kontinuierlichen länglichen per Spritzguss geformten Länge (10) aus geformtem Material, umfassend eine Vielzahl von beabstandeten ungefähr in einer Linie angeordneten elektrischen oder mechanischen Teile (20, 54), die in die und entlang eines wesentlichen Teils der Länge des formbaren Materials eingebaut sind, umfassend die folgenden Schritte:

a) Bereitstellen einer Form (30), die ausgebildet ist, um ein erstes Segment (22) aus einem formbaren Material zu bilden, das erste Segment umfassend eine aufeinanderfolgende Reihe von verbundenen integralen formbaren Einheiten (12) umfassend erste und zweite Endeinheiten (24, 26) und eine Vielzahl von mittleren Einheiten zwischen den Endeinheiten, wobei die Form ferner so ausgebildet (43) ist, dass ein elektrisches oder mechanisches Teil (20, 54) an einigen der mittleren und Endeinheiten vorgesehen werden kann, wobei wenigstens die zweite Endeinheit (26) einen vorstehenden Abschnitt bildet, der ungefähr in einer Linie zu den elektrischen oder mechanischen Teilen angeordnet ist;

b) Bereitstellen eines elektrischen oder mechanischen Teils (20, 54) an der Form an Positionen, die der Position von einigen formbaren Einheiten, die geformt werden sollen, entsprechen;

c) Einleiten von geschmolzenem Material in die Form (30) und Ermöglichen einer Abkühlung der gleichen zum Bilden eines ersten Segments (22) aus formbarem Material, wobei einige der ersten und zweiten Endeinheiten und mittleren Einheiten ein elektrisches oder mechanisches Teil (20, 54) beinhalten und um dieses herum geformt sind;

d) Entfernen des ersten Segments mit seinen eingebauten Teilen (20, 54) von der Form und erneutes Einfügen der zweiten Endeinheit (26) des ersten Segments in die Form (30);

e) Bereitstellen eines elektrischen oder mechanischen Teils an der Form an Positionen, die der Position von einigen formbaren Einheiten, die geformt werden sollen, entsprechen;

f) Einleiten von geschmolzenem Material in die

Form (30) und Ermöglichen einer Abkühlung der gleichen zum Bilden eines zweiten Segments (22) mit ersten und zweiten Endeinheiten (24, 26) und mittleren Einheiten, wobei einige der ersten und zweiten Endeinheiten und mittleren Einheiten ein elektrisches oder mechanisches Teil beinhalten und um dieses herum geformt sind, wobei die erste Einheit (24) des zweiten Segments die zweite Endeinheit (26) des ersten Segments überlappt, wobei die ersten und zweiten Segmente durch ihre jeweiligen zweiten und ersten Endeinheiten integral gekoppelt sind, wobei ihre jeweiligen eingebauten elektrischen oder mechanischen Teile (20, 54) ausgerichtet sind; und

g) Wiederholen der Schritte d), e) und f) bezüglich der sukzessiven Segmente und so weiter, wobei sukzessive Segmente gebildet und integral gekoppelt werden können, um die längliche Länge (10) aus formbarem Material, die elektrische oder mechanische Teile beinhaltet, zu bilden.

19. Verfahren nach Anspruch 18, ferner umfassend den folgenden Schritt:

h) Bereitstellen eines elektrischen oder mechanischen Teils (20, 54) an der Form an Positionen, die der Position die zweiten Endeinheit (26) jedes der Segmente (22) entsprechen.

20. Verfahren nach Anspruch 18, ferner umfassend den Schritt einer Aufwicklung der kontinuierlichen Länge (10) auf eine Rolle (52).

Revendications

1. Bande continue (10) d'unités séparables (12) destinée à contenir des composants électriques ou mécaniques espacés (20), ladite bande comprenant :

(a) une série consécutive d'au moins trois segments moulés par injection (22) de matériau moulable comprenant des segments d'extrémité,

(b) chaque segment (22) comprenant une série consécutive d'unités reliées en un seul bloc mais séparable (12) constituée d'une première unité d'extrémité de tête (24) et d'une seconde unité d'extrémité de queue (26) partiellement formées et d'une pluralité d'unités intermédiaires complètement formées entre les unités d'extrémités, lesdites unités intermédiaires et d'extrémités étant chacune faite du matériau moulable et étant séparées suivant leur longueur les unes des autres,

(c) à l'exception des segments d'extrémité, l'une des première et seconde unités d'extrémités (26) de chaque segment (22) comporte une partie moulée en une pièce avec une partie en saillie de l'autre des première et seconde unités d'extrémités (24) du segment adjacent afin de former une unité de fixage d'interverrouillage complètement formée, d'où il résulte que des segments successifs (22) sont accouplés de façon intégrée par leur unité d'interverrouillage respective et d'où il résulte que la partie en saillie de l'autre (24) des première et seconde unités d'extrémités de chaque segment a eu un trou ou une partie en creux remplie d'un matériau moulé de la partie moulée en une pièce de l'une (26) des première et seconde unités d'extrémités du segment adjacent, ladite partie en saillie de l'autre unité d'extrémité (24) étant en saillie vers l'arrière et s'étendant approximativement de façon alignée avec la bande (10),

(d) les segments accouplés de façon intégrée (22) formant une bande allongée (10) d'unités complètement formées séparables moulées (12),

(e) chacune des unités intermédiaires étant configurée de façon similaire, les parties en saillie moulées en une pièce des première et seconde unités d'extrémités formant les unités d'interverrouillage présentant une configuration sensiblement la même que celle des unités intermédiaires,

d'où il résulte que chacune des unités intermédiaires et chacune des unités d'interverrouillage sont utilisables lorsqu'elles sont séparées de la bande en vue de recevoir un composant électrique ou mécanique ou bien en tant que composant électrique ou mécanique.

2. Bande selon la revendication 1, dans laquelle les unités intermédiaires comportent chacune un trou (16) de dimension donnée en vue de recevoir un composant électrique ou mécanique (20), les unités d'interverrouillage comportent également chacune un trou (16) de la dimension donnée afin de recevoir un composant électrique ou mécanique.

3. Bande selon la revendication 2, dans laquelle les trous dans les unités intermédiaires et les unités d'interverrouillage (12) présentent un pas donné, comprenant en outre une pluralité de composants électriques ou mécaniques (20) espacés approximativement alignés, chacun étant monté dans l'un des trous (16) dans les unités intermédiaires et d'interverrouillage pratiquement sur la longueur de ladite bande allongée (10), d'où il résulte qu'une distance de pas désirée entre les composants montés est conservée à l'intérieur de la série consécutive de segments (22) et qu'une ou plusieurs unités in-

dividuelles (12) peuvent être séparées de la bande, comme souhaité.

4. Bande selon la revendication 1, comprenant en outre des encoches (14) entre les unités (12) positionnées de façon à permettre que chaque unité lorsqu'elle est séparée au niveau d'une encoche forme une unité complète sans débris détachables excessifs.

5. Bande continue selon la revendication 1, dans laquelle les unités intermédiaires comportent chacune un trou (16) de dimension donnée en vue de recevoir un composant électrique ou mécanique (20), la partie en saillie (26) comporte également au moins un trou de réception de composant (16) en vue de recevoir un composant électrique ou mécanique, la partie moulée en une pièce (24) permettant un accès dudit composant électrique ou mécanique vers le au moins un trou de réception de composant dans la partie en saillie.

6. Bande continue selon la revendication 5, dans laquelle les trous de réception de composant (16) sont régulièrement espacés et une distance de pas désirée entre les composants montés (20) est conservée.

7. Bande continue selon la revendication 1, comprenant en outre une pluralité de composants électriques ou mécaniques (20) espacés approximativement alignés sous forme de broches électriques, chacune étant montée dans l'un des trous (16) des unités intermédiaires et d'interverrouillage suivant pratiquement la longueur de ladite bande allongée (10), d'où il résulte qu'une distance de pas désirée entre les broches montées est conservée à l'intérieur de la série consécutive de segments (22), et une ou plusieurs unités individuelles (12) en 'tant que supports de broches séparables peuvent être séparées de la bande comme souhaité.

8. Bande continue selon la revendication 7, dans laquelle les supports de broches séparables (12) sont séparés par un moyen de séparation (14).

9. En combinaison avec la bande selon la revendication 1, bobine (52) sur laquelle la bande (10) est enroulée.

10. Bande continue (10) de supports de broches séparables (12), ladite bande comprenant :

a) une série consécutive de segments moulés par injection (22) d'un matériau moulable constitué de segments de tête (22') suivis de segments de queue (22),
b) chaque segment (22, 22') comprenant une série consécutive de supports de broches reliés en une pièce mais séparables (12) formés du matériau moulable, et comportant des parties de tête et de queue et comprenant au moins une unité d'extrémité de queue partiellement formée (24), chaque segment comprenant au moins trois unités de supports,
c) au moins une unité d'extrémité de tête (26) au niveau de la partie de tête de chaque segment de queue (22) comportant une partie de surmoulage de la au moins une unité d'extrémité de queue partiellement formée (24) du segment de tête adjacent (22'), d'où il résulte que les segments successifs (22, 22') sont accouplés de façon intégrée par les parties surmoulées respectives de la au moins une unité d'extrémité de queue (24) et par la au moins une unité d'extrémité de tête (26) du segment adjacent (22), et la au moins une unité d'extrémité de queue (24) de chaque segment comportant une partie en creux ou un trou rempli du matériau moulé de la partie surmoulée de la au moins une unité d'extrémité de tête (26) du segment adjacent (22),
d) les segments accouplés de façon intégrée (22, 22') formant une bande continue (10) d'unités de support moulé (12), lesdites unités comportant chacune au moins un trou de réception de broche (16) et étant séparées suivant leur longueur les unes des autres, et
e) une pluralité de composants de broches électriquement conductrices espacés approximativement alignés (20) disposés dans lesdits trous de réception de broche (16) dans ladite bande continue (10) et suivant pratiquement la longueur de ladite broche continue (10), d'où il résulte qu'une ou plusieurs unités de support individuelles (12) contenant des broches (20) peuvent être séparées de la bande comme souhaité.

11. Bande continue (10) selon la revendication 10, dans laquelle la partie surmoulée comporte également au moins un trou de réception de broche (16) destiné à recevoir un composant électriquement conducteur (20) et la partie de surmoulage permettant un accès du composant électriquement conducteur (20) vers le au moins un trou de réception de broche dans la partie en saillie.

12. Bande continue selon la revendication 10, dans laquelle chaque' unité d'extrémité de tête (26) et unité d'extrémité de queue partiellement formée (24) qui sont surmoulées comportent un trou (16) destiné à recevoir un composant de broche (20) et les trous sont alignés.

13. Procédé de formation d'une longueur de matériau

moulable moulée par injection allongée continue comprenant une pluralité de composants espacés longitudinalement (20, 54) présentant une distance de pas désirée, comprenant les étapes suivantes :

(a) fournir un moule (30) configuré pour former un premier segment (22) de matériau moulable, ledit premier segment (22) comprenant une série consécutive d'unités intégrées reliées (12) présentant une épaisseur donnée et constituées d'unités d'extrémités de tête (24) et d'unités d'extrémités de queue (26) et une pluralité d'unités intermédiaires entre les unités d'extrémités, au moins les unités d'extrémités de queue (26) formant une partie en saillie partiellement formée approximativement alignée avec les unités intermédiaires, ladite partie en saillie étant munie de zones en creux,
(b) introduire dans le moule (30) un matériau fondu et permettre à celui-ci de refroidir pour former un premier segment (22) d'un matériau moulable avec les unités d'extrémités de queue (26) comprenant la partie en saillie avec les zones en creux,
(c) retirer du moule (30) le premier segment et réinsérer la partie en saillie du premier segment dans le moule,
(d) introduire dans le moule (30) un matériau fondu et permettre à celui-ci de refroidir afin de former un second segment avec une unité d'extrémité de tête et une unité d'extrémité de queue et des unités intermédiaires, l'unité d'extrémité de tête (24) du second segment étant surmoulée avec la partie en saillie de l'unité d'extrémité de queue (26) du premier segment et encapsulant au moins partiellement celle-ci, les zones en creux dans la partie en saillie étant remplies d'un matériau moulé, d'où il résulte que les premier et second segments sont accouplés de façon intégrée par leurs parties surmoulée et en saillie respectives,
(e) répéter l'étape (c) pour le second segment et l'étape (d) pour former un troisième segment accouplé de façon intégrée au second segment, et ainsi de suite, d'où il résulte que des segments successifs peuvent être formés et accouplés de façon intégrée pour former une bande continue allongée (10) de segments moulés (22), et
(f) disposer les composants suivant la longueur de la bande de façon espacée de manière à conserver la distance de pas désirée.

14. Procédé selon la revendication 13, dans lequel les unités (12) sont des unités de supports et les composants sont des broches électriques (20).

15. Procédé selon la revendication 14, comprenant en outre l'étape consistant à enrouler la bande continue (10) sur une bobine (52).

16. Procédé selon la revendication 14, comprenant en outre l'étape consistant à, durant les étapes (b), (d) et (e), utiliser des broches de noyaux (43) espacées suivant la distance de pas désirée afin de former les trous (16) dans les unités (12) en vue de recevoir les broches électriques (20), comprenant au moins un trou de réception de broche (16) dans la partie en saillie.

17. Procédé selon la revendication 14, comprenant en outre l'étape consistant à, durant les étapes (b), (d), et (e), former des trous de réception de broche alignés dans les unités d'extrémités de queue (16) et d'extrémités de tête (24) surmoulées afin de recevoir les broches électriques (20).

18. Procédé de formation d'une longueur (10) moulée par injection allongée continue de matériau moulable comprenant une pluralité de pièces électriques ou mécaniques espacées approximativement alignées (20, 54) incorporées dans une partie substantielle de la longueur dudit matériau moulable et le long de celle-ci, comprenant les étapes suivantes :

(a) fournir un moule (30) configuré pour former un premier segment (22) de matériau moulable, ledit premier segment comprenant une série consécutive d'unités moulables reliées, intégrées (12) constituées des première et seconde unités d'extrémités (24, 26) et d'une pluralité d'unités intermédiaires entre les unités d'extrémités, le moule étant en outre d'une forme telle (43) qu'une pièce électrique ou mécanique (20, 54) puisse être prévue au niveau de certaines des unités intermédiaires et d'extrémités, au moins la seconde unité d'extrémité (26) formant une partie en saillie approximativement alignée avec les pièces électriques ou mécaniques,
(b) prévoir une pièce électrique ou mécanique (20, 54) au niveau du moule à des positions correspondant à la position de certaines unités moulables devant être moulées,
(c) introduire dans le moule (30) un matériau fondu et laisser celui-ci refroidir afin de former un premier segment (22) d'un matériau moulable avec certaines des première et seconde unités d'extrémités et des unités intermédiaires incorporant une pièce électrique ou mécanique (20, 54) et étant moulées autour de celle-ci,
(d) retirer du moule le premier segment avec ses pièces incorporées (20, 54) et réinsérer la seconde unité d'extrémité (26) dû premier segment dans le moule (30),

(e) fournir une pièce électrique ou mécanique au niveau du moule à des positions correspondant à la position de certaines unités moulables devant être moulées,

(f) introduire dans le moule (30) un matériau fondu et laisser celui-ci refroidir pour former un second segment (22) avec les première et seconde unités d'extrémités (24, 26) et les unités intermédiaires, certaines des première et seconde unités d'extrémités et des unités intermédiaires incorporant une pièce électrique ou mécanique et étant moulées autour de celle-ci, et la première unité d'extrémité (24) du second segment recouvrant la seconde unité d'extrémité (26) du premier segment, d'où il résulte que les premier et second segments sont accouplés de façon intégrée par leurs seconde et première unités d'extrémités respectives, leurs pièces électriques ou mécaniques incorporées respectives (20, 54) étant alignées, et

(g) répéter les étapes (d), (e) et (f) pour des segments successifs, et ainsi de suite, d'où il résulte que les segments successifs peuvent être formés et accouplés de façon intégrée afin de constituer ladite longueur allongée (10) de matériau moulable incorporant des pièces électriques ou mécaniques.

19. Procédé selon la revendication 18, comprenant en outre l'étape consistant à :

(h) fournir une pièce électrique ou mécanique (20, 54) au niveau du moule à des positions correspondant à la position de la seconde unité d'extrémité (26) de chacun des segments (22).

20. Procédé selon la revendication 18, comprenant en outre l'étape consistant à enrouler la longueur continue (10) sur une bobine (52).

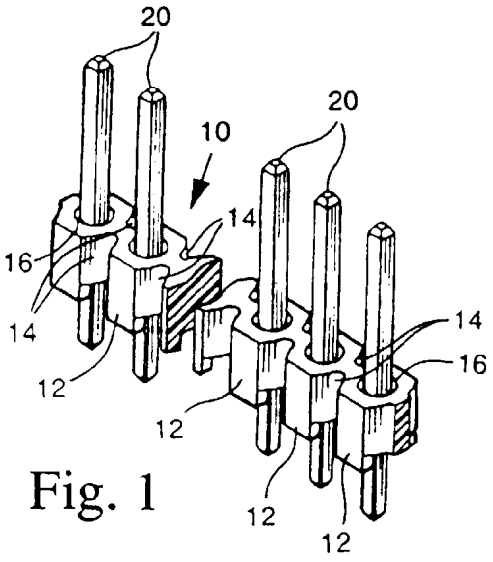

Fig. 1

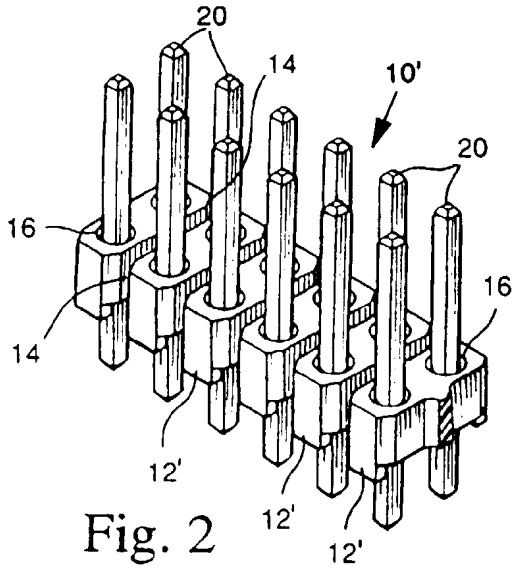

Fig. 2

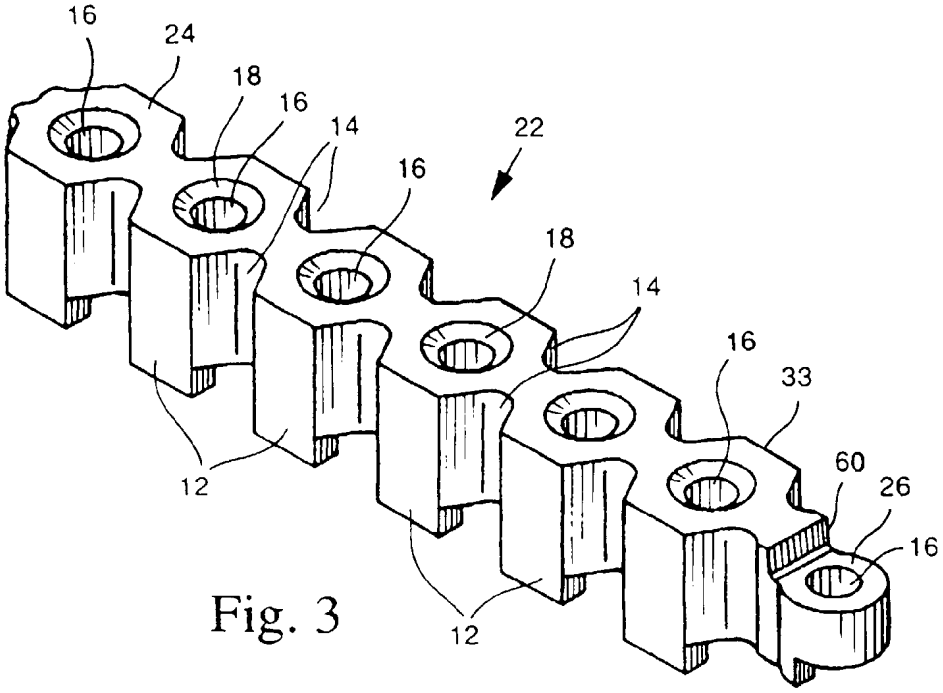

Fig. 3

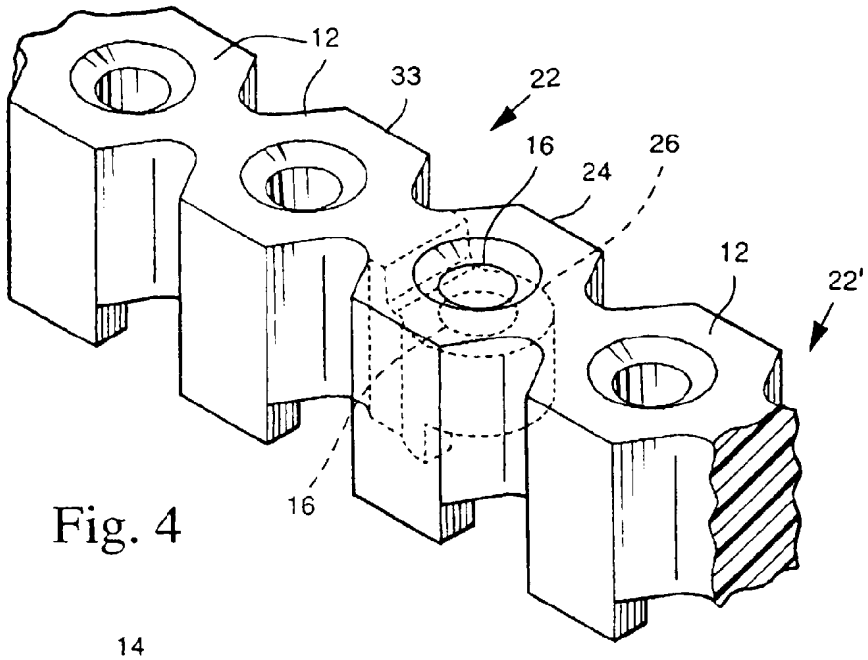

Fig. 4

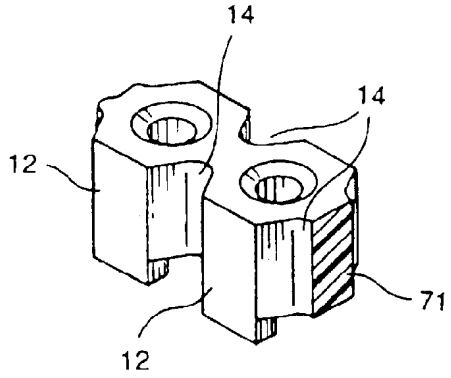

Fig. 4A

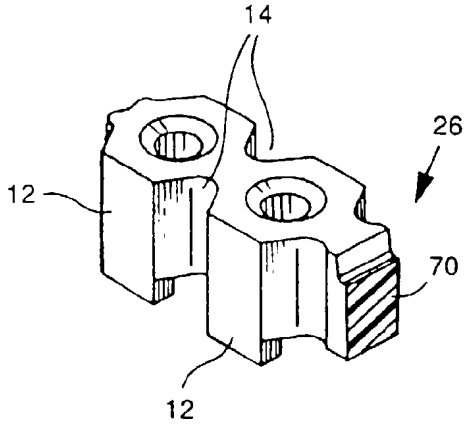

Fig. 4B

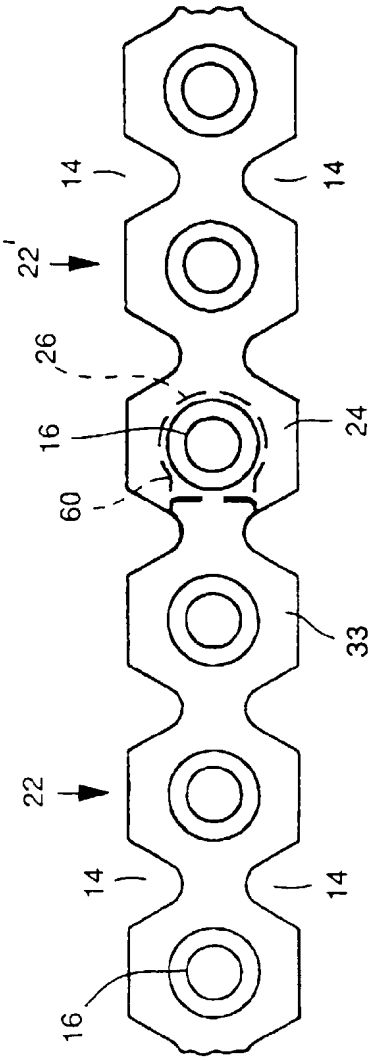
14
14
22'
26
16
24
60
33
22
14
14
16

Fig. 5

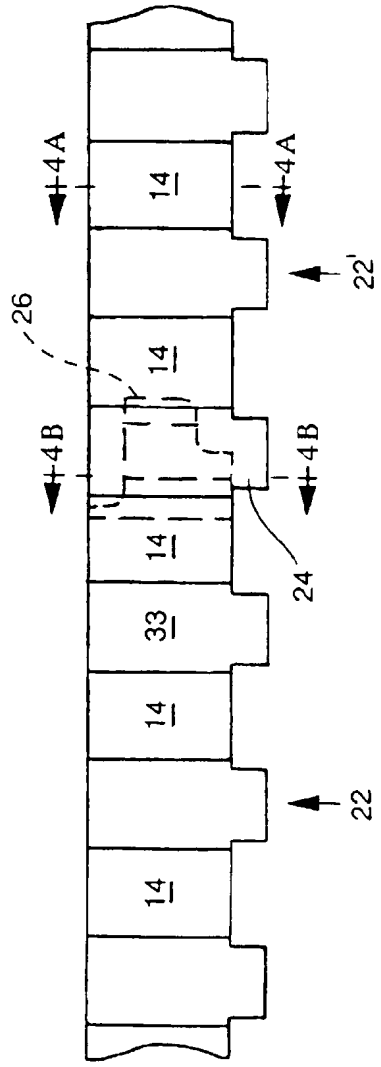
4A
4A
14
22'
26
14
4B
4B
14
24
33
14
14
22

Fig. 6

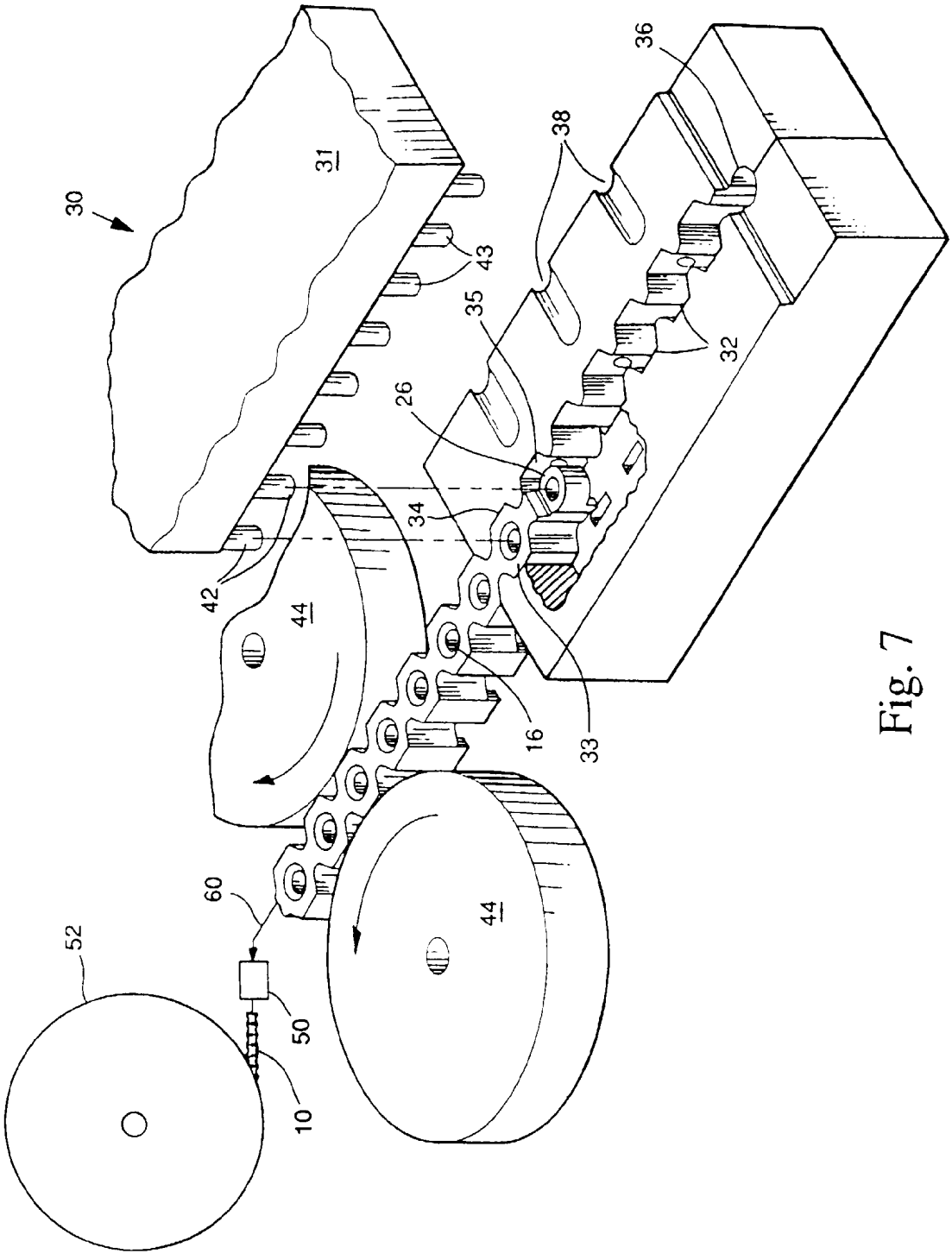

Fig. 7

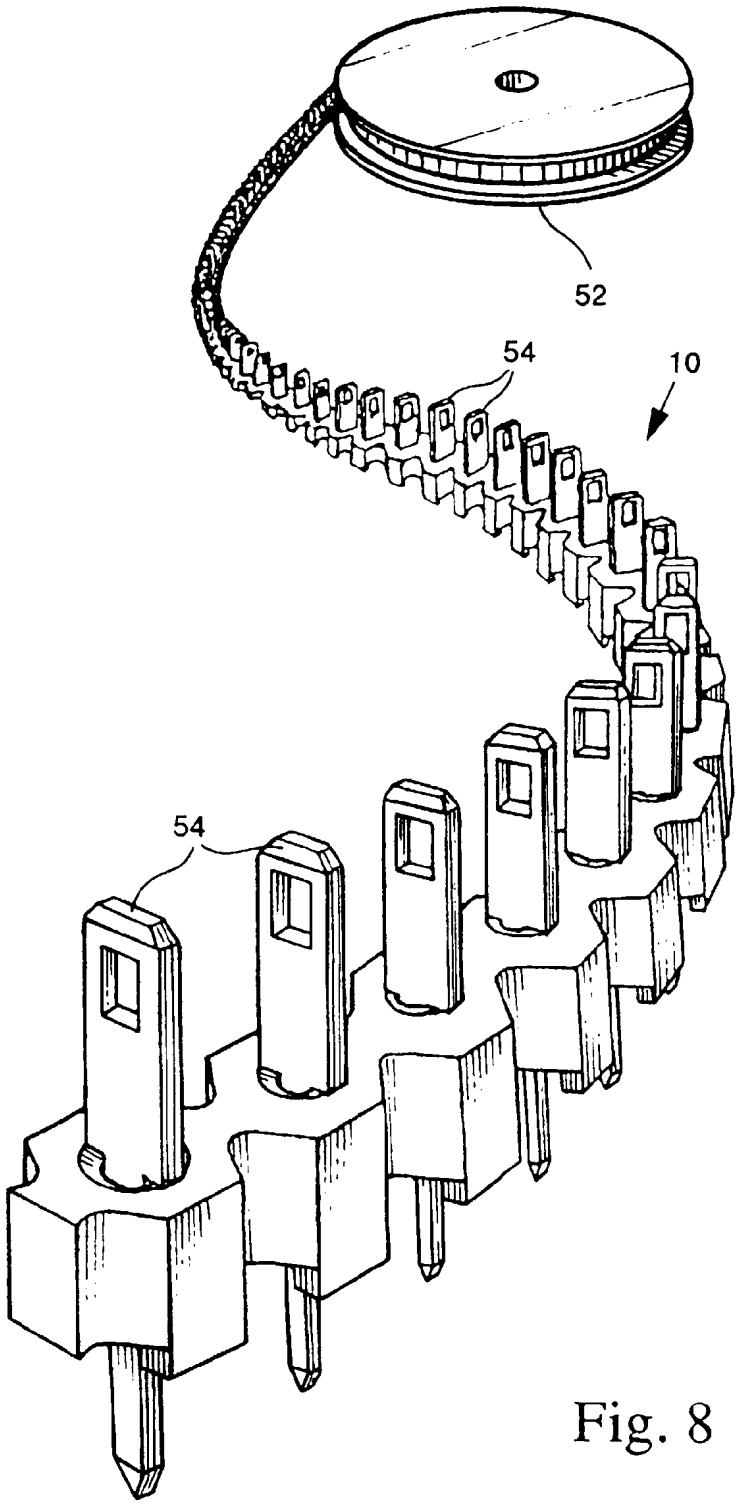

Fig. 8